for just below the critical temperature the vertical ingot must behave as a very powerful magnet indeed.

For all the lesser magnetic fields, there is a temperature of maximum permeability which is nearer to the critical temperature the smaller the magnetic field. But *at* that temperature the magnetic qualities in almost all fields practically vanish. Hence, when the magnetising force is very small, the change from enormously magnetic to almost non-magnetic takes place with extreme suddenness.

Above the critical temperature, iron is but feebly magnetic; yet it is still much more readily affected by a magnet than most other feebly magnetic bodies. Not till a white heat is reached, do the magnetic qualities of iron become imperceptible.

It is not easy in an article like the present to deal with the changes which occur in the electrical resistance of iron, but the following remarks may be of interest:—

The experiments of Dewar and Fleming have shown that at a temperature of – 200° C. the specific electrical resistance of iron is extremely low. Throughout the range of temperature included between that extreme of cold and the critical temperature, about + 780° C., the resistance rises at a steadily increasing *rate*, so that at the latter temperature it is over 150 *times* as great as at the former: far in excess of that of any known alloy at ordinary temperatures (crystalline metals and their alloys excepted), and about equalling liquid mercury for high specific resistance. On still further raising the temperature of the iron, it is found that the *rate* of rise of resistance, instead of further increasing, very rapidly falls off till, at a white heat, the resistance of iron increases only slowly with the temperature.

It has long been known that this *increasing rate of rise* of resistance with temperature is a characteristic possessed by the magnetic metals alone. Here now we see that no sooner does the iron cease to be strongly magnetic than this quality disappears, and becomes exchanged for an opposite one, namely, a *decreasing* rate of rise of resistance with temperature. In some hitherto unpublished experiments on Hadfield's manganese steel (a non-magnetic steel which can be rendered magnetic by annealing), I have observed a precisely similar change of the resistance-temperature function to take place during the annealing of this steel, thus furnishing a second case of this obscure resistance-change accompanying the change from magnetic to non-magnetic, in one and the same sample.

The connection between magnetic and electrical properties is evidently not a very simple one, but in the face of these facts it is hard to deny that there is one; and it is only by trying to find out how the various physical properties depend upon magnetism that we may hope to arrive at a comprehensive explanation of that obscure but most interesting condition of matter.

DAVID K. MORRIS.

EARLY MAN IN SCOTLAND.[1]

IN Scotland, as in other countries, man existed before the time of written history. The conditions under which his remains are found, and the works which he has left behind him, provide the data for determining their age, not absolutely or capable of being expressed in numbers of years, but relatively to each other.

Marked differences existed in the physical conditions of Scotland, and indeed in the northern parts of England also, as compared with the southern districts of England and the adjoining parts of France and Belgium at the first appearance of primeval man in those countries. It is the more necessary, therefore, that the conditions then prevailing in Scotland should not be overlooked.

No evidence sufficient to satisfy geologists has been advanced to prove that man existed in Britain during the period called Tertiary. So far, indeed, as Scotland is concerned, even if it were admitted that in other parts of the globe man had been on the earth during Tertiary times, there is little likelihood that his remains could have been preserved; for in that country the Tertiary is represented chiefly by volcanic rocks, and a few patches of sand and gravel with rolled sea shells belonging to the closing stages of that period.

From the careful study which geologists have given to the surface of Scotland, it is evident that at the commencement of the period termed Quaternary or Pleistocene, immediately succeeding the Tertiary, the whole of the country was covered with ice which formed a great sheet 3000 or 4000 feet thick in the low grounds, of which the lower boulder clay, or Till, as it is termed, was the ground-moraine.

As an upper boulder clay also occurs, which is often separated from the lower boulder clay by stratified deposits, some of which contained marine, and others fresh water and terrestrial organic remains, it is obvious that the Ice Age was not one uninterrupted period of continuous cold.[1] The lower and upper tills are the ground-moraines of independent ice sheets, each indicating a distinct epoch, separated by an interglacial period. The earlier epoch was that of maximum glaciation, and the ice sheet extended over the north and middle of England, as far south as the Thames Valley and the foot of the Cotswold Hills; but the high moors in Derbyshire and Yorkshire and the tops of the highest mountains in Wales and Scotland rose above its surface. The great Mer de Glace stretched westward over Ireland into the Atlantic, whilst on the east it was continuous across the North Sea with a similar ice sheet which covered Scandinavia and the region of the Baltic, and extended south to the foot of the hills of central Europe, and overspread much of the great central plain. In the extreme south of England, therefore, the conditions differed from those that obtained in the country further north. Although not actually covered with a sheet of ice, yet the more southern counties had been of necessity under the influence of cold, and must have been subjected to the effects produced by rain and snow, by freezing and thawing.

During the succeeding interglacial epoch the climate eventually became temperate and genial, and vegetable and animal life abounded. It is to this stage that most of the Pleistocene river alluvia and cave deposits of England and the adjacent parts of the continent are assigned. The British Islands appear at that time to have been joined to the continent, and the same mammalian fauna then occupied Britain, France and Belgium, which implied similar climatic conditions. As examples of these, it may be sufficient to name the larger mammals, as the cave and grizzly bear, the hyæna, lion, Irish deer, reindeer, hippopotamus, woolly rhinoceros, straight-tusked elephant and mammoth, all of which are now either locally or wholly extinct.

Abundant evidence exists that man was contemporaneous with these mammals in western Europe, as is shown by the presence of his bones alongside of theirs, and of numerous works of his hands, more especially the implements and tools which he had manufactured and employed. To a large extent these consisted of flint, rudely chipped and fashioned. To these implements, and to the men who made them, the well-known term "Palæolithic" is applied. But along with these, other implements have been discovered, made from the bones, horns and teeth of the larger mammals, on some of which animal forms and incidents of the chase have been sculptured both with taste and skill. Up to now, however, no trace of pottery which can without question be referred to Palæolithic men has been found, and no habitations, except the caves and rock shelters which nature provided for them.

One may now consider how far northwards in Britain Palæolithic man and the large mammals, with which he was contemporaneous, have been traced. The exploration of caverns, made by Prof. Boyd Dawkins and other geologists associated with him, has proved that bones of certain of the mammals of this epoch were present in caves in Derbyshire, Yorkshire and North Wales, and that human remains and implements of Palæolithic type have been found along with them in the Robin Hood cave in the Cresswell Crags, and in caverns in North and South Wales.

When Scotland is considered, evidence of the existence of the mammals of this epoch is not so abundant, yet the interglacial beds of that country have yielded remains of mammoth, reindeer, Irish elk, urus, and horse. But notwithstanding the keen scrutiny to which the superficial deposits in Scotland have been subjected by the members of the Geological Survey and others, no traces either of the bones of Palæolithic man or of the work of his hands have been discovered in North Britain. This, indeed, is not much a matter of surprise, for it must be remembered that, subsequent to the genial interglacial epoch, another ice sheet, that of the upper boulder clay, made its appearance, grinding over the surface of the land, wearing away alluvia, and largely obliterating the relics of interglacial times. Hence interglacial beds occur only at intervals and are very fragmentary. Nor in Scotland are there any caves similar in dimensions to those which in England and elsewhere have yielded such abundant traces of Palæolithic man and his mammalian congeners. If Palæolithic man ever did exist in Scotland, and there is no reason why he might not have migrated northward from Yorkshire and Wales, yet one could hardly expect to discover traces of his former presence. In Scotland there are no massive limestones, with extensive caverns, in which man could have sheltered, and in which his relics and remains could have been secure from destruction during the advance of the second ice sheet. It is only in the alluvial deposits of interglacial times that such traces have been preserved, but these deposits, as we have seen, were ploughed out and to a great extent demolished by the later sheet of ice. The shreds that remain, however, are of extreme interest, from the fact that they contain relics of the Pleistocene mammals, with which Palæolithic man was contemporaneous; and there is a bare chance that some day traces of man himself may be encountered in the same deposits.

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[1] A discourse delivered at the Royal Institution, London, by Sir William Turner, F.R.S.

[1] For the evidence on which these statements are based, consult the "Great Ice Age," by Prof. James Geikie, edition 1894, also his "Classification of European Glacial Deposits," in *Journal of Geology*, vol. iii., A May 1895.

Geologists have shown that in the regions which were overflowed by the second or minor ice sheet no traces of Palæolithic man, or of the southern mammals with which he was associated, have ever been met with in British superficial alluvia. When found in those regions out of Scotland, they occurred in caves chiefly, and sometimes in the stratified deposits which here and there underlie the upper boulder clay and its accompanying gravels.

So far as Scotland is concerned, one must look for a period subsequent to the melting of the second great ice sheet for evidence of the existence of early man. After its disappearance important fluctuations in temperature and in the relative level of land and sea took place from time to time, so that the climate and the area of land in Scotland differed in some measure from what is known at the present day. Eventually a period of cold again occurred, not so severe, undoubtedly, as in the two preceding glacial epochs, but sufficient to bring into existence considerable district ice sheets and extensive valley-glaciers in the Highlands and Southern Uplands. Scotland at this stage was partially submerged, and many of the Highland glaciers reached the sea and gave origin to icebergs. The submergence slightly exceeded 100 feet, and the marine deposits formed at the time are charged with arctic shells and many erratic blocks and débris of rocks. On a subsequent elevation of the land, the beach formed at this level constituted a terrace, well marked on the coast line in many districts, and now known as the 100-foot beach.

There is good reason to believe that the elevation referred to was of sufficient extent to join Britain again to the continent. It is to this stage that the great timber trees which underlie the old peat bogs of Scotland are referred. The peat with its underlying forest bed passes out to sea, and is overlaid in the Carse lands of the Tay and the Forth by marine deposits, which form another well-marked terrace, the 45 to 50 foot raised beach of geologists.

Thus the elevation of the land that followed after the formation of the 100-foot beach coincided with an amelioration of climate and with the presence of an abundant vegetation, and large mammals, such as the red-deer, the elk, and the *Bos primigenus* roamed through the woods. While these conditions obtained partial submergence again ensued, and the sea rose to fifty feet, or thereabouts, above its present level. Within recent years it has been shown that during this period of partial submergence glaciers reached the sea in certain Highland firths, which would seem to show that the climate was hardly so genial as during the preceding continental condition of the British area, when that region was clothed with great forests. Ere long, however, elevation once more supervened, and the sea retreated to a lower level. Here it paused for some time, and so another well-marked terrace was formed, which is known as the 25 to 30 foot beach.

There is not any evidence of the presence of man in Scotland during the formation of the 100-foot beach or terrace, but one can speak with certainty of his presence there during the period of formation of the later beaches. If one could put oneself into the position of an observer who, at the time of the 40-50 foot submergence, had stood on the rock on which Stirling Castle is now built, instead of the present carse lands growing abundant grass and grain, and studded with towns, villages, and farmhouses, one would have seen a great arm of the sea extending almost if not quite across the country from east to west, and separating the land south of the Forth from that to the north. In this sea great whales and other marine animals disported themselves, and sought for their food. Abundant evidence, that this was the condition at that time in the Carse of Stirling, is furnished by the discovery during the present century of no fewer than twelve skeletons of whalebone whales belonging to the genus Balænoptera or Finner whales, imbedded in the deposit of mud, blue silt and clay which formed the bed of the estuary.[1] This Carse clay, as it is called, is now in places from 45 to 50 feet above the present high-water mark, and is extensively used for the manufacture of bricks and tiles. At a still lower level lies the carse clay of the 25-30 foot terrace. Until the beginning of the present century the clay had been covered by an extensive peat moss, which the proprietors of the land have removed. The question which has now to be considered is—Did man exist in Scotland at the period of the formation of the carse clays and of the two lower sea beaches? There is undoubted evidence that he did.

Along the margin of the 45-50 foot terrace in the neighbourhood of Falkirk one comes upon the shell-mounds and kitchen-middens of Neolithic man. All these occur on or at the base of the bluffs which overlook the carse lands—or, in other words, upon the old sea-coast. Again, in the Carse of Gowrie, a dug-out canoe was seen at the very base of the deposits, and immediately above the buried forest-bed of the Tay Valley. The 25-30 foot beach has been excavated out of the 40-50 foot terrace; it is largely a plain of erosion rather than of accumulation. It is probable, therefore, that many of the relics of man and his contemporaries which have been obtained at certain depths in the 25-30 foot beach may really belong to the period of the 40-50 foot beach. Some of these finds will now be referred to.

In 1819 the bones of a great Fin-whale, estimated about 72 feet long, were exposed in the carse land adjoining the gate leading into the grounds of Airthrey Castle, near Bridge of Allan, about 25 feet above the level of high water of spring tides. Two pieces of stag's horn, through one of which a hole about an inch in diameter had been bored, were found close to the skeleton. In 1824, on the estate of Blair Drummond, in the district of Menteith, a whale's skeleton was exposed, and along with it a fragment of a stag's horn which was said to have a hole in it and to have been like that found along with the Airthrey whale. Mr. Home Drummond also states that a small piece of wood was present in the hole, which fitted it, but on drying, shrunk considerably. Unfortunately these specimens have been lost, and no drawings or more detailed descriptions were ever apparently published, though in some geological and archæological works they have been stated, without any authority, to have been lances or harpoons. Twenty years ago the skeleton of another whale was exposed at Meiklewood, Gargunnock, a few miles to the west of Stirling, and resting upon the front of its skull was a portion of the beam of the antler of a red deer, fashioned into an implement eleven inches long, and six and a half inches in greatest girth; a hole had been bored through the beam, in which was a piece of wood one inch and three-quarters long, apparently the remains of a handle. The implement was truncated at one end, and shaped so that it could have been used as a hammer, whilst the opposite end was smooth and bevelled to a chisel or axe-shaped edge formed by the hard external part of the antler.[2] There can be no doubt that this implement resembled those found alongside of the Airthrey and Blair Drummond whales earlier in the century, and it effectually disposes of the statement that they were lances or harpoons. Dug-out canoes have indeed been found imbedded in the Carse clays at a similar level, so that the people of that day had discovered a means of chasing the whale in the water; one can, however, scarcely conceive it possible to manufacture a horn implement sufficent to penetrate the tough skin and blubber of one of these huge animals, and to hold it in its efforts to escape. It is much more probable that the whale had been stranded at the ebb of the tide in the shallower water near the shore, and that the people had descended from the neighbouring heights, and had used their horn implements, with their chisel-like edges, to flense the carcass of its load of flesh and blubber, and had carried the spoil to their respective habitations. There can be little doubt that these implements rank, along with the dug-out canoes, as the oldest relics made with human hands which have up to this time been found in Scotland, and that they belong to the earliest period of occupation by Neolithic man.

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[1] See more particularly Mr. Milne Home's "Ancient Water Lines" (Edinburgh, 1882), and "The Raised Beaches of the Forth Valley," by D. B. Morris (Stirling, 1892).

[2] I described this implement in Reports of British Association, 1889, p. 790. It has subsequently been figured in a Report by Dr. Munro in the *Proceedings of the Society of Antiquaries*, 1896.

After the oscillations in the relative level of land and sea had ceased, and the beach found at the present day had been formed, evidence of the presence of Neolithic man and of mammals, both wild and domesticated, such as now exist in Scotland, becomes greatly multiplied.

Shallow caves or rock shelters situated in the cliff which bounds the esplanade at Oban Bay, which, after being closed for centuries by a landslide from the adjacent height, had recently been quarried into in obtaining stone for building purposes, were described by the lecturer.[1] The caves were as a rule 100 yards inland, and about 30 feet or more above the present high-water mark. They had, no doubt, been formed by the action of the waves at the period of formation of the 25-30 foot beach, for the floor of one of the caves was covered by a layer of gravel and pebbles, which had obviously been washed there when the sea had had access to it.

In these caves, bones representing fifteen human skeletons, men, women, and children were found; also bones of the *Bos longifrons*, red and roe deer, pig, dog, goat, badger, and otter, shells of edible molluscs, bones of fish, and claws of crabs; flint scrapers, hammer stones, implements of bone and horn fashioned into the form of pins, borers and chisel-shaped instruments. In one cave several harpoons or fish spears made of the horns of deer were obtained; similar in form to those found in the Victoria Cave, Settle, in Kent's Cavern, and in the grotto of La Madelaine, France, which in some of these instances have been associated with Palæolithic objects.

An account was then given of the construction and contents of the chambered horned cairns in Caithness and the north-west of Scotland, which have been so carefully investigated and described by Dr. Joseph Anderson ("Scotland in Pagan Times," Edinburgh, 1886). The presence of incinerated bones and of unburnt skeletons showed the cairns to have been places of interment, whilst flint flakes and scrapers, bone and polished stone implements, and shallow vessels of coarse clay, associated them with Neolithic man, obviously the same race as the builders of the English long barrows.

Stone abounds in Scotland, and the polished stone implements which have been found in every county, in the soil and near the surface of the ground, are often of large size, and beautifully ground and polished. Flint, on the other hand, is confined to a few localities, as the island of Mull and limited areas in the counties of Banff and Aberdeen. The nodules are as a rule small in size, and though adapted for the manufacture of arrow-heads and scrapers, flint does not seem to have attained the same importance in Scotland as the raw material provided by nature for the manufacture of articles used by Neolithic man, as was the case in England and Ireland.

Although there is ample evidence of the nature of the implements and weapons manufactured by Neolithic man, and of his methods of interment in rock shelters and chambered cairns, no traces of built dwellings which can be ascribed to the people of this period have been discovered. Doubtless their habitations were constructed of loose stones and turf, and sun-dried clay, or of the skins of animals killed in the chase spread over the branches of trees, which, from their fragile and destructible character, have not been preserved.

In the course of time stone and bone, readily procurable, and which are directly provided by nature for the use of man, gave place to materials which require for their manufacture considerable skill and knowledge. The introduction of bronze as a substance out of which useful articles could be made, marked an important step in human development, and could only take place after men had learnt by observation the ores of copper and tin, and by experiment the methods of extracting the metals from them, and the proportions in which they should be combined in the alloy in order to secure the necessary hardness. So far as Scotland is concerned, bronze must have been introduced from without; its manufacture could not have been of indigenous development, as the ores of tin and copper do not occur in North Britain. Doubtless it came from the southern part of our island, and was extensively employed in South Britain long before it became substituted in the north for the more primitive materials.

There is abundant information that Scotland had a Bronze Age. Swords, spears, bucklers, bracelets, rings, fish hooks, axes, chisels, sickles and other implements made of this metal have been found in considerable numbers. These objects occur sometimes singly, at others in collections or hoards in peat mosses, or even at the bottom of lochs and rivers, or buried in the soil as if they had been placed there with a view to concealment, and then, through the death or removal of their owners, had been lost sight of. In many instances these weapons and implements are elegant in design, show great mechanical ability in their construction, and are ornamented with much taste and skill. Instances also are not uncommon in which objects of bronze are found in the sepulchres of the period.

In the study of the Bronze Age in Scotland a want is experienced similar to that felt in a review of the Neolithic period. There are no buildings which can be distinctly regarded as dwelling-places for the men of this time. With them, however, as in the Polished Stone Age, there is evidence of the mode in which they disposed of their dead friends and relatives. Interments which there are good grounds for associating with these people, have been exposed in the formation of roads and railways, and in agricultural operations. Where the surface of the ground has not been cultivated or otherwise disturbed, in almost every county tumuli, mounds, hillocks and cairns occur, the exploration of which has in many cases yielded interesting results. In no instance, however, have chambered cairns, divided into compartments, and possessing an entrance passage, been found associated with articles made of bronze. The sepulchral arrangements of the period possessed a greater simplicity than is shown in the chambered cairn.

The interments in the Bronze Age were sometimes that of a single individual in a knoll or mound, or under a cairn artificially constructed, and now overgrown with grass, heather and whin bushes, or, as is not uncommon, in a collection of sand or gravel near the sea shore, or on a river bank, or in the moraine of some long-vanished glacier. At other times, in similar localities, two to six interments had been made as if in a family burying ground. At others the interments were much more numerous, and represented doubtless the cemetery of a tribe or clan; one of the best known of these was observed some years ago at Law Park, near St. Andrews, in which about twenty interments were recognised. In another at Alloa, twenty-two separate interments were exposed. Quite recently, immediately to the east of Edinburgh, in the districts now known as Inveresk and Musselburgh, not less than fifty interments of this period have been brought to light, in connection with building operations, which implies that then, as now, this part of the country was settled and had a considerable population.

Two very distinct types of interment prevailed, viz. Cremation, with or without cinerary urns; and Inhumation, the unburnt body being enclosed in a stone cist or coffin. From an analysis of 144 localities in Scotland of burials which may be associated with the Bronze Age,[1] and which included about 400 distinct interments, it would appear that in fifty-one of these localities the bodies had all been cremated; in sixty they had been buried in stone cists; in fifteen the same mound or cemetery furnished examples of both kinds of sepulchre, and in the rest the kind of interment was not precisely recorded. These diversities did not express tribal differences, but seemed to have prevailed generally throughout Scotland. Both cremation and inhumation are found in counties so remote from each other as Sutherland in the north and Wigton in the south, in Fife and the Lothians on the east, and in Argyll and the distant Hebrides in the west, as well as in the intermediate districts.

The cremation had been effected by wood fires, for in many localities charcoal has been found in considerable quantity at the place of interment. The heat generated was sufficient to reduce the body to ashes, and to burn the organic matter out of the bones, which fell into greyish-white fragments, often curiously cracked and contorted, which were not very friable. They were then collected and usually placed in an urn of a form and size which we now call Cinerary. When a bank of sand or gravel was convenient, a hole three or four feet deep was made and the urn lodged in it. Sometimes the urn stood erect, and a flat stone was placed across the mouth before the hole was filled in with sand and earth; at others a bed of compacted earth, or of small stones, or of a flat stone, was made at the bottom of the hole, and the urn, with its contents, was inverted. In some cases the urn was protected by loose stones arranged around it. In obviously exceptional instances, it may be perhaps of a tribal chieftain, a small stone cist was built to enclose the urn, and even a cairn of stones was piled above and around to protect it and to mark the spot.

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[1] For a detailed description, see papers by Dr. Joseph Anderson and the author in *Proc. Scot. Soc. Antiquaries*, 1895.

[1] Most of these are recorded in the "Archæologica Scotica," the *Proceedings* of the Scottish Society of Antiquaries, and Dr. Joseph Anderson's "Scotland in Pagan Times"; whilst others, in the author's note books, have not yet been published.

Cremated interments not contained in urns have been recorded in a few instances, and in them the surrounding sand or gravel has usually been discoloured, from the blackened remains and charcoal having to some extent become diffused through it.

The largest examples of cinerary urns were from 12 to 16 inches in height, with a flat narrow bottom, and 10 to 12 inches wide at the mouth. About one-third the distance below the mouth the urn swelled out to its widest diameter, and was surrounded by one or two mouldings, between which and the mouth the outer surface was often decorated with lines which ran horizontally, or vertically, or obliquely; sometimes they intersected, and formed a chevron or a diamond-shaped pattern. Below the mouldings, the surface was without pattern, though sometimes raised into an additional simple circular moulding.

When the inhumation of an unburnt body was decided on, a rude cist or coffin, formed of undressed flattened stones, was built for its reception. As a rule, the sides and ends of the cist were formed each of a single slab of sandstone, schist, gneiss, granite or other stones provided by the rock in the neighbourhood; but in some instances of a stone of a different character from the adjoining rocks, and obviously brought from a distance. The stones were set on edge and supported a great slab, which, being laid horizontally, formed the lid or cover of the cist, and which was much thicker and heavier than the side and end stones; sometimes, as if for additional protection, a second massive slab was placed on the top of the proper cover. The floor of the cist was formed, when the earth was shallow, of the native rock, and at other times of compacted earth, or a layer of pebbles, or of flat stones. Usually the stone walls and the cover of the cist were simply in apposition, but sometimes they were cemented together with clay. In some cists, exposed a few years ago on the farm of Cousland, near Dalkeith, the peculiarity was observed of the cist being divided in its long direction into two compartments by a stone slab down the middle.

The cists were oblong, the length exceeding the breadth, and although they varied in size, those for adults being larger than for children, they were always shorter than would have been required for a body to be extended at full length. As the end stones were usually set within the extremities of the side stones, the internal measurement of length was some inches less than the external. The average dimensions may be given for the interior about 4 feet in length, 2 feet in breadth, and 2 feet in depth. The cover slab was much larger both in length and breadth, as it overlapped both the sides and ends.

These cists remind one, in their general form and plan, but on a much smaller scale, both as regards the size of the enclosed space and the magnitude of the stones, of the dolmens so frequent in Brittany. As survivals in modern times, we may point to the empty stone boxes, on the cover stone of which an inscription is incised, to be seen in so many country churchyards, built on the ground superficial to the pit in which the body in its wooden coffin has been inhumed.

Owing to the shortness of the cist the body could not be extended at full length, but was laid upon its side, with the elbows bent, so that the hands were close to the face; the hips and knee joints were also bent so that the knees were in front of the body.

Usually only a single skeleton has been found in a cist, either a man or a woman as the case may be. Sometimes two skeletons have been seen, at times a man's and a woman's, doubtless husband and wife; in others the second skeleton has been that of a child. Sometimes the cist was below the average in size, and contained only the skeleton of a child or young person. Such examples throw light upon the family relations of the people of this period. They show that they desired to preserve the associations of kinsfolk even after death; and when the cist contained the remains only of a child it was constructed with the same care as if it had been the tomb of a chief.

When cremated bodies are found associated with stone cists in the same cemetery, the cinerary urns in which the ashes were customarily deposited lie outside the cists, and in quite independent excavations in the soil, but in such close proximity as to show that they belonged to the same period. In two instances short cists have been opened, in which, alongside of the skeleton of an unburnt body, were cremated human bones, not contained in a cinerary urn, but scattered on the floor of the cist, which conclusively prove that both cremation and inhumation were sometimes in practice at the same interment.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MR. CHARLES E. GREEN, President of the Board of Trustees of Princeton University, died suddenly on December 24.

LAFAYETTE COLLEGE, at Easton, Pennsylvania, suffered serious loss by fire a few days ago for the second time in its history. Pardee Hall, with its valuable collections, was nearly destroyed, and the library was much injured.

Science states that bills have been again introduced into both Houses of Congress to establish the University of the United States. Such a bill was introduced by Senator Edmunds in 1890 and referred to a select committee, which reported unanimously in its favour. The standing committee since appointed has also reported unanimously in its favour, and it is said that the bill will probably be passed during the present session.

AMONG recent appointments are:—Dr. S. Fuchs to be associate professor of physiology at the University at Jena; Prof. Waldemar Lindgren, of the U.S. Geological Survey, to be professor of metallurgy and mining engineering in Stanford University; Mr. Edgar R. Cumings, of Cornell University, to be instructor in geology in the University of Indiana; Dr. W. Ophüls to be professor of pathological anatomy in the University of Missouri.

AN additional chair of Chemistry has been founded and endowed in the McGill University, Montreal, by Mr. W. C. McDonald, who recently erected a new chemical building at a cost of 240,000 dols. The same donor has provided an additional endowment of 50,000 dols. for the faculty of Law, to the deanship of which faculty, with the chair of Roman Law, Mr. F. P. Walton, of the Scotch Bar, was recently appointed. Mr. McDonald has, moreover, supplemented the existing endowments associated with his name by a further gift of 200,000 dols. to provide for any deficiency in income that may result from the fall in the rate of interest on investments.

SCIENTIFIC SERIALS.

Symons's Monthly Meteorological Magazine, December, 1897.—A wet day in a wet district. A remarkably heavy rainfall occurred in the Lake district on November 12. At Skelwith Fold (Lancashire) it amounted to 6·03 inches, or 7·5 per cent. of the annual mean; at Skelwith Bridge (Westmoreland) 6·35 inches were measured, or 7·8 per cent., and at Leathwaite (Cumberland) 8·03 inches, or 6·1 per cent. of the annual mean. There was no thunderstorm, but a continuous pelting rain nearly throughout the twenty-four hours. Naturally, much damage was caused by floods.—Temperature variations in November. An observer at Cheltenham draws attention to some remarkable changes during November 14 to 20, the greatest of which was a fall of 21°·4 between the 18th and 19th. In the neighbourhood of London the greatest difference between any two consecutive readings during November was 19°·6. Mr. Symons points out that nearly similar differences also occurred in 1866 and 1893.—The same number also contains some useful particulars, with illustrations, respecting Richard's instruments for use with kites or balloons. Pressure, humidity, and temperature are simultaneously recorded on a single sheet of paper; the total weight of the instrument is only 36 ounces.

Wiedemann's Annalen der Physik und Chemie, No. 12.—Origin of contact electricity, by C. Christiansen. The gas surrounding a jet of zinc, lead, or tin, amalgam has a marked influence upon its uninterrupted length. Air, oxygen, and sulphurous acid have the effect of retarding the breaking up of the jet, owing to contact electrification. The author measures the length of the continuous jet by making it part of a circuit containing a galvanometer, the steadiness of the needle denoting